HOW DID WE FIND OUT ABOUT

OUR HUMAN ROOTS

Isaac Asimov

1. The Stone Age

ACCORDING TO THE BIBLE, the first human beings were Adam and Eve, and they looked just like human beings today. Until modern times Jews, Christians, and Moslems believed this to be so.

How long ago was it that Adam and Eve were created? The Bible doesn't say exactly, but people who studied the Bible tried to figure it out. They knew the dates of some of the later events in the Bible. For instance, they knew that the Babylonians had captured Jerusalem and destroyed its Temple in 586 B.C.

Starting with that, they figured backward. They considered how long different kings in the Bible were said to rule, how long certain ancient figures like Abraham and Noah were said to live, and how old their fathers were when they were born.

About 1630 an Irish scholar named James Ussher (USH-er, 1581-1656) worked out a date for the Creation in this way. He said it took place in 4004 B.C. Many people accepted this. If this were so, then the world would be less than six thousand years old.

What about history outside the Bible? Does it help?

In the time of Ussher ordinary history just didn't reach that far back. The history of ancient Rome was known, for instance, but Rome was only founded in 753 B.C.

Ancient Greek history went farther back. The first Olympic Games were held in 776 B.C., and the legendary Trojan War seems to have been fought a little before 1200 B.C.

That's still a long way from biblical creation. Is there any history before that of Greece?

The ancient Creek historians thought that Egypt’s history was much more ancient than their own. There were a lot of carved and painted writings that survived from ancient Egypt, but no one could read those writings. There seemed no way of getting details about Egyptian history.

But then, in 1799, a French army under Napoleon Bonaparte invaded Egypt an officer in his army discovered an inscribed stone in the town of Rosetta at one of the mouths of the Nile River. This "Rosetta Stone" was inscribed with three different languages, two forms of Egyptian and one Greek. Historians knew how to read Greek. If the inscription was the same in all three languages, the Rosetta stone had an Egyptian message with a Greek translation. From the Greek, historians could learn how to read Egyptian. It wasn't easy, even with the Greek as a guide, since it was hard to tell which Egyptian symbols went along with which Greek words. Still, little by little, it was done. An English physician, Thomas Young (YUNG, 1773-1829) made the first important progress in 1818. Then, in 1821, a French scholar, Jean Franyois Champollion (shahn-poh-LYONE, 1790- 1832) completed the job.

Once historians could read Egyptian, they slowly worked out Egyptian history. The largest Egyptian pyramids were built about 2500 B.C., and the Egyptian kingdom was founded about 2850 B.C.

Then, in 1846, an inscription was found in western Iran made up of several languages. One of the languages was a very old one, used by the ancient civilizations in what is now Iraq, the region of the Tigris and Euphrates rivers.

The history of that region was found to be even older than that of Egypt. In Iraq, writing was first invented by a people called the Sumerians, perhaps as early as 3200 B.C.

All this seemed to fit in with the Bible. If Creation was in 4004 B.C., there was room for all the ancient civilizations, even that of the Sumerians, which seemed to be the oldest.

Meanwhile new notions were arising in the science of geology, which is the study of the rocks that make up the earth.

A Scottish geologist, James Hutton (1726-1797), studied the way rocks were formed. Some seemed to have started as a kind of mud that was pressed together until all the water was squeezed out and what was left became hard. This is called sedimentary rock because the mud settled out as a sediment from a Latin word meaning "to settle out"

Other rocks formed out of hot, molten lava from volcanoes. All rocks slowly wore away under the action of wind and water.

Every process that seemed to form rock, or wear it away, did its work very, very slowly. The rocks had to have taken millions of years to form. In 1785 Hutton wrote about his observations and explained why he thought the earth was very old.

For a long time people refused to accept what Hutton said, because it seemed to go against the Bible. Between 1830 and 1833, however, another Scottish geologist, Charles Lyell (LY-ul, 1797-1875), wrote a three-volume book that supported Hutton. Since Hutton's time, more evidence had been collected. For instance, it had been found that the rocks of the crust were divided into "strata" or layers, and these strata could be followed over long distances. Deductions about the past history of the earth could be made from the appearance of the strata, the rocks they contained, and so on. Lyell explained it all very carefully. After that scientists were convinced that the earth was very old, and they decided that the biblical story of Creation could not be right.

That meant that perhaps human beings were in existence long before 4004 B.C.

Historians knew, for instance, that there was a time when people didn't know how to make iron out of iron ore. They had only learned how to do that a little before 1000 B.C. Before that time, bronze was used for weapons. For- instance, the Creek and Trojan warriors of the *Iliad* fought in bronze armor.

But Bronze only came into use at about 3200 B.C., which was jilt about the time when writing was invented. Before that, metal wasn't known at all, and human beings had to use chipped stones for tools and weapons.

A Danish scientist, Christian Jorgenson Thomsen (TOM-sen 1788-1865), summed it up in 1834. "We now live in the Iron Age," he said, "but before that was a Bronze Age, and before that was a Stone Age."

WE can have history only when writing exists. When human beings do not write, we can only find out about them by studying the ruins of their temples, houses, and tools. This can give us some information, but it can't tell us the things that happened in the order that they happened, which is what we need for history.

The time before writing was invented is therefore called prehistoric ("before history"). The Stone Age is a prehistoric time. The people who lived then are prehistoric people.

Stone tools had been found from very early Egyptian and Sumerian times, but they were pretty good tools. In other words, human beings had already been making them for a long time and had learned to do good work. Perhaps cruder tools could be found dating back thousands of years before Egypt and Sumeria.

In 1797 an English geologist names John Frere (FREHR, 1740-1807) found such crude stone tools in an excavation he was making in southern England. He found them thirteen feet underground. Prehistoric people must have thrown them out or left them behind, and those tools must then have been buried gradually under layers of rock. Judging by the amount of time it must have taken for those layers of rock to build up, the tools must have been many thousands of years old.

Along with the tools, there were the bones of animals. These were not the bones of animals we know today, but of slightly different animals that no longer live--that are extinct.

These bones had been buried in the ground so long that they had gradually turned to stone. Such ancient bones, or any traces of ancient living things, are called fossils (from a Latin word meaning "to dig," because they have to be dug out of the earth).

It was a long time ago that those animals became extinct, and the tools must have existed before that time. The people who made those tools must have existed before that time, too.

Other crude and very old tools were discovered here and there. In 1860 a French paleontologist (pay-lee-on-TOL-oh-jist, a student of ancient extinct forms of life) named Edouard -Armand Lartet (lahr- TAY, 1801-1871) discovered a mammoth tooth in a cave. Mammoths are an extinct animal related to modern elephants. None had been alive for many thousands of years.

On that mammoth tooth there was a scratched drawing of a mammoth. It looked the way a mammoth should look, judging from the mammoth skeletons that have been found. It included details, though, that made it seem that the artist had seen a living mammoth.

Scientists were convinced by then that prehistoric people had been around a long time. They began to speak of an Old Stone Age, a Middle Stone Age, and a New Stone Age. By studying the old tools and dating them as best they could; it seemed to these scientists that the very oldest tools went back a hundred thousand years or more and since then human beings had advanced slowly to make better and better tools.

Then, in 1879, a Spanish geologist, Marcellino de Sautuola (duh-soh-TOH-luh, died 1888), explored some newly discovered caves. Caves were a good place to look for traces of prehistoric men, because caves had been used for shelter. (They are sometimes called cavemen for that reason.) Also the caves were tools could filled with sedimentary rock, and in it old

Marcellino de Sautola's five-year-old daughter was with him while he was digging by the light of' a lamp, the little girl looked up and cried out, "Bulls! Bulls!" Her father looked up and there on the walls and ceiling of the cave were drawings of various animals in vivid colors and clever detail.

Other cave drawings have been found, and it seems that although prehistoric people had not yet learned all we know today, they had minds that could create art as good as ours.

2. Neanderthal Man

WHAT DID THESE prehistoric people look like? We could tell if we could find ancient skeletons and fossil remains of human beings. The trouble is that most fossils are formed when animals are trapped in water, drown, and are buried in mud before they are eaten. When the mud turns to sedimentary rock, the hard parts of the animals, especially teeth, become fossils.

Human beings are too intelligent to be trapped in this way often, so there are very few human fossils to work with. Still, once in a while some are found.

In 1868, eleven years before the first cave painting, had been found, workmen were digging out a roadbed for a railroad in southwestern France. They dug through a cave that was called Cro-Magnon (kroh-ma-NYON) and uncovered the skeletons of five human beings.

Lartet, who had discovered the mammoth tooth with the drawing on it, was sent to the site. He studied it carefully, in order to find out how old the rocks were in which the skeletons were found. It eventually turned out that the bones could well be 35,000 years old. (Other- skeletons of the sort might between 50,000 years old.)

People began to speak of` Cro-Magnon Man as the kind of` Stone Age people who did the cave paintings thousands of years before Adam and Eve were supposed to have lived.

From the skeletons it seemed that Cro-Magnon Man looked very much like us. If anything, he was a little taller than the average height of people today, and his brain was a little larger.

Back in 1735 a Swedish botanist, Carolus Linnaeus (lih-NEE-us, 1707-1778), classified the different plants and animals he knew and gave them all double Latin names. The first name described a group, or *genus* (JEE-nus), to which the animal belonged. The second name referred to the *species* (SPEE-sheez), or the particular kind of animal within the group.

Linnaeus classified human beings as *Homo sapiens* (HOH-moh-S AY-pee-ens). Home was the genus to which human beings belonged and comes from the Latin word for "man." Human beings are the only organisms alive today who belong to that genus. The species is sapiens, from a Latin word meaning "intelligent," so that Home sapiens means "intelligent man."

The skeletons of the Cro-Magnons were so much like the skeletons of present-day people that it was clear that those ancients, too, were members of Home sapiens.

Could it be, then, that human beings did come into existence looking exactly like human beings, as the Bible said? Perhaps it was only the dates that were wrong. Perhaps Adam and Eve were created 50,000 years ago, not 6,000 years ago, and before that there were no human beings at all.

One person who thought differently was an English naturalist, Charles Robert Darwin (1809-1882). When Darwin was twenty-four years old, he joined the crew of a ship that was going on a five-year voyage of scientific exploration. It gave Darwin a chance to study plants and animals in all parts of the world. He noticed how the appearance of members of certain species of' animals changed little by little as the ship traveled down the coast of South America. He found that on the isolated Galapagos (gah-LAH- pah-gohs) Islands in the Pacific Ocean there were fourteen different species of birds called finches. None of them were found anywhere else in the world, though they resembled a finch found on the South American mainland. How had this happened?

He began to think that perhaps species changed with time. Perhaps new species developed, or "evolved," little by little out of older species. He started collecting evidence that could prove this, even though he knew that his "theory of evolution" would shock many people who would feel that it contradicted the Bible.

In 1859 he published a book on the subject called The Origin of Species. It created a sensation. For many years there were arguments over the theory, but, little by little, scientists came to accept it.

If all the plant and animal species in the world slowly evolved from earlier species, what about human beings? Were human beings descended from a species that was not quite human, and was that descended from a still-earlier species that was even less human, and so on?

Darwin didn't discuss that point in his book, but others at once began to speculate on this. The geologist Lyell published a book in 1863 in which he argued that human beings had evolved in just this way. In 1871 Darwin published another book, in which he presented all the evidence he could find in favor of the notion.

Human beings, after all, have anatomies that ale very much like the apes of Africa, the chimpanzee and the gorilla. Perhaps all three evolved from a common ancestor that existed many thousands of

years ago. That common ancestor must have looked far more apelike than human like.

This horrified many people, who clung to the Bible and who refused to believe that Adam and Eve could have had apelike ancestors.

If Darwin were correct, there should be fossil traces of` human ancestors, skeletons that would be partway between apes and human beings and that would link the two forms of life. These had not been found in Darwin's time, and such a creature came to be called the missing link.

Without this missing link, many people refused to believe that human beings had evolved. The Cro-Magnon skeletons, which had just been found, were perfectly human, even though they were so old. They were by no means missing links.

Yet some interesting bones had turned up eleven years before the Cro-Magnon skeletons had been found, and even before Darwin had published his book.

On the Rhine River in western Germany there is a valley called Neanderthal (nay-AHN-dur-TAHL). In 1857, in the Neanderthal, diggers uncovered part of a skull and some arms and leg bones that looked human but not entirely human.

The skull seemed to show a retreating forehead, and there were bony ridges where the eyebrows would have been. The teeth were larger than ordinary human teeth, the jaw protruded more, and the chin receded. It all seemed more apelike than humanlike.

Scientists were interested, but most refused to consider that the bones were of any importance. The German physician Audolf Virchow (FIR-khuv, 1821-1902), who didn't believe in Darwin's theory, insisted that the skeleton belonged to an ordinary human being who had a bone disease.

Most scientists agreed with him, but a French physician, Pierre Paul Broca (broh-K~1H, 1824-1880), ar6·ued that the shape of the skull could not he the result of` bone disease and that the bone itself looked normal.

Other skeletons of the sort were discovered here and there in later years, and they all showed the retreating forehead, the eyebrow ridges, the receding chin, and the large teeth. They couldn't all have the same bone disease. Broca was right, and Virchow was wrong.

Scientists began to talk about Neanderthal Man. He was even given a Latin name, *Homo neanderthalensis* (nay-AHN-dur-tahl-EN-sis)· He was considered to belong to the same genus that human beings belonged to but was a different species.

It wasn't until 1911, though, that a French paleontologist, Pierre Marcellin Boule (BOOL, 1861-1942), first managed to get a practically complete Neanderthal skeleton.

From the skeleton it seemed possible to reconstruct what Neanderthal Man looked like when it was alive. It seemed short compared to Cro-Magnon Man, with the males only a little over five feet tall on the average and the females a little shorter.

Some people thought they were "ape men," so that they were pictured in that way. When a plaster cast or a drawing of a Cro-Magnon Man was made, he was always shown to be clean-shaven and handsome, with a thoughtful look on his face. Neanderthal Man, on the other hand, was shown needing a shave, standing in a stooped, shambling way, and with a stupid, brutal expression on his face.

This seems to have been quite wrong. A closer study of many Neanderthal skeletons showed that Boule's skeleton was that of an old man with a bad case of arthritis. More normal skeletons showed that Neanderthal Man stood upright as easily as we do. His face was ugly by our standards, but his brain was lust as large as ours, and in all other ways, as far as could be told from the skeleton, he was completely human.

Traces of Neanderthal Man were eventually found not only in Europe but also in northern Africa and in Asia. About a hundred different skeletons have now been located at some forty different sites.

The most recent ones are only 30,000 years old, so Neanderthal Man and Cro-Magnon Man must have been living together on this planet for about 20,000 years. There are even some skeletons that seem to be

Sites of important Neanderthal discoveries partway between the two, which shows that there may have been interbreeding.

Scientists are now quite sure that Neanderthal Man is also *Homo sapiens*. The name *Homo neanderthalensis* has been thrown out.

Neanderthal Man is, however, the oldest variety of *Homo sapiens*. There are traces of Neanderthal Man that are as much as 100,000 or even 150,000 years old. He may have lived on the planet for as much as 100,000 years before Cro-Magnon Man appeared.

Then, after a while, Neanderthal Man died out. Was he killed off by the larger and stronger Cro-Magnon Man? As yet, we don't really know.

Did Cro-Magnon Man evolve from Neanderthal Man? Probably not. They must both have evolved From some still more primitive creature.

3. Java Man and Peking Man

CLEARLY, NEANDERTHAL MAN, if, he is also Home sapiens, is not the missing link. Even before Neanderthal Man was found to be the same species as we are, he was clearly too much like us to be the missing link.

Yet those who believed in Darwin's theory were sure there had to be one. The German biologist Ernst Heinrich Haeckel (HEK-ul, 1834-1919) had even given it a scientific name. He called it

Pithecanthropus (PITH-ih-kan-THROH-pus) from Greek words meaning "ape-man." It would be something, he thought, that was halfway between an ape and a human being.

A Dutch physician, Eugine Dubois (dyoo-BWAH, 1858-1941), was very anxious to find the bones of Pithecanthropus, and he thought he knew how to go about it. The best way to find the bones of a very primitive ancestor of human beings would be to look in those places where the more primitive relatives of human beings, the apes, still lived. Of the four kinds of apes, the chimpanzee and the gorilla lived in Africa, and the orangutan and the gibbon lived in Southeast Asia and Indonesia.

Pithecanthropus would be another kind of ape, halfway to man, and it must have been developed from the same ancestor as the other apes. It must therefore have lived in one of the two places, Africa or Southeast Asia and Indonesia.

At that time, Haeckel was convinced that of all the apes, the gibbons were most closely related to the human being. (He was wrong; they were the least closely related, but Dubois didn't know that.) Dubois therefore decided he would look in Asia.

As it happened, the Indonesian islands belonged to the Netherlands at the time and were part of what were called the Dutch East Indies. Since Dubois was a Dutchman, he thought he might get to the East Indies somehow and then spend his time looking for *Pithecanthropus* there.

He quit his university job and enlisted in the Dutch army. (His friends were horrified.) In 1887 he managed to get himself assigned to the East Indies as a military surgeon. Once there, he began digging in caves to see if he could discover any very ancient human remains.

He spent over three years searching, and then, in 1891, near a village named Trinil in south-central Java, he came across some teeth and parts of an ancient skull. The skull showed a retreating forehead and eyebrow ridges like those of Neanderthal Man. However, the inside of the skull was quite small.

The human brain weighs about three pounds, on the average, but the brain inside the skill that Dubois had found couldn't have weighed more than two pounds at the most. Also, you couldn't explain the small brain by supposing the skull was that of an infant. The bony eyebrow ridges were so well developed that it had to be an adult skull.

Yet the brain that was once inside the skull, small as it was, was twice as large as that of a gorilla. In other words, the size of the brain was just about halfway between ape and man. The teeth he found also seemed to lean toward the ape a bit.

Dubois was sure he had discovered *Pithecanthropus*. He kept on going through the caves carefully, looking for any other relic he could find. A year later he found a thighbone only forty-five feet from where he had found the skull and at the same level in the rock. It looked as old as the skull, but it looked quite human. From its shape, it seemed clear that the original creature who possessed it could stand upright as easily as a human being could.

Dubois called the skeleton he had discovered *Pithecanthropus erectus* (ee-HEK-tus), or "the erect Ape-man." It is often called, however, by the simpler name of *Java Man.*

1894 Dubois published his findings. The next year he returned to the Netherlands and found himself in the middle of a battle.

This was the first case of a fossil that might be the 'missing link," and people who disagreed with Darwin's theory said it was the skull of an ape. Others said it was the skull of a human idiot whose brain had never grown. Still others said that the two chief fossil finds didn't belong to each other and that Dubois had an ape skull and a human thigh bone.

Dubois got so tired of' all the shouting and arguing that he became sorry he had ever made the finds. He grew cranky and just locked up the bones and wouldn't let anyone look at them for years.

The best way of settling the matter was to go back to Java and find more bones of Java Man. The task was undertaken by a German paleontologist, Gustav H. R. von Keenigswald (fun- KO Y-n igz-vahld).

In the late 1930's he went to Java and spent years looking. He had local people helping him. He explained exactly what to look for and told them that he would pay ten cents for any piece they brought in, however small. Some people did find a skull, but before bringing it in, they broke it into small pieces to collect a dime for each one.

Even so, von Koenigswald ended up with three skulls and some pieces of jaw, with teeth in place. There might be one human idiot with a small brain, but there wouldn't be four. Java Man was really a humanlike creature that was not Home sapiens.

Homo sapiens, together with creatures that are not *Homo sapiens* but are more like human beings than they are like apes, are now lumped together as hominids (HOM-ih-nidz). Java Man was the first hominid discovered who was not *Homo sapiens.*

Dubois was still alive when von Koenigswald made his discoveries but he was over eighty, an embittered old man. He had stopped believing in Java Man himself and now he would only keep saying it was the skeleton of an ape. Even when von Koenigswald tried to explain that it was now proven that it was no ape, Dubois wouldn't believe him, and shortly after that, he died.

Meanwhile, attention turned to China. Chinese doctors thought that if old fossil bones and teeth were ground into powder they could be used in medicine. For that reason, fossils were to be found in Chinese drugstores. In 1900 one of the old teeth turned out to be human, and paleontologists began to wonder whether pre-human creatures might once have dwelt in China.

About twenty-seven miles southwest of Peking, which is now the capital of China, there is a town called Chokoutien, near which there are a number of caves that had been filled up with hard earth. That was the sort of place one could look to find the old trace s of hominids.

In one place in those caves they found bits of a rock called quartz. It didn't seem that the quartz should have been there naturally. Maybe primitive hominids had brought it there for use in making tools. That encouraged the Canadian paleontologist Davidson Black (1884-1934) to keep on working there.

In 1923 a tooth was found; in 1926 another; in 1927 a third. These teeth were studied carefully, and they seemed not quite human but not quite ape. It was decided that they belonged to a hominid that was give the name *Sinanthropus pekinensis* (SY-nan- THR OH-pus- PE E-kih- NEN- sis), which mean s "Chinese man of Peking." Some people call it *Peking Man.*

Finally in 1929, a Chinese paleontologist, Pei, in his digging, uncovered something that had the curve of a skull. Then, more and more pieces of skull, jaw, and teeth began to show up. After Black's death in 1934, the work continued under a German paleontologist, Franz Weidenreich (VY-den-RIKHE, 1873-1948). Eventually, portions of forty different hominids were uncovered.

This time there was no argument. Everyone accepted *Peking Man* as a hominid that was not Home

Unfortunately, the Japanese had invaded China and taken over the area in 1937. They allowed the digging to continue, but in 1941, things got more and more complicated, especially since it looked as though there might be war between Japan and the United States. The paleontologists finally decided to send the bones to the United States for safekeeping. The bones didn't start their trip, however, until December 5, 1941, and two days later the Japanese attacked Pearl Harbor.

In the confusion that followed, no one knows for sure what happened, but the bones of Peking Man were never seen again. They are probably gone fore vet-.

In the time that the bones were studied, however, enough was learned to show that Peking Man was very much like Java Man, except that the brain of Peking Man was a little larger of the two. Nowadays, paleontologists don't think it is right to consider Java Man and Peking Man as two different hominids. They are both varieties of the same species, just as Neanderthal Man and Cro-Magnon Mall are both varieties of the same species.

What's more, although Java Man and Peking Man are not Home sapiens, they are close enough to it to be part of the same genus. Therefore, names like *Pithecanthropus* and *Sinanthropus* have been done away with. Instead, Java Man and Peking Man are now said to be examples of Home erectus, the small-brained species that preceded the large- brained *Home sapiens.*

After World War II, bones of Home erectus were discovered in Africa, and there's just a chance that they may exist in Europe. (That's all, however. No hominids ever entered the Americas or Australia or most of the islands of the world until Home sapiens carne along.)

Home erectus had a brain about two-thirds the size of *Home sapiens*, but it walked like a human being and it made tools. In fact, in the Chokoutien caves there are indications that Peking Man used fire. *Home erectus* may have come into existence as long as 1.5 million years ago and died out about 500,000 years ago.

Did *Homo erectus* not really die out? Did it just slowly evolve into Home sapiens as its brain grew larger?

It certainly seems logical to think so, but one paleontologist who disagreed was an Englishman named Louis S. B. Leakey (LEE-kee, 1903-1972).

Leakey's parents were missionaries, and Leakey spent his childhood in East Africa, where his parents were working. He was educated at Cambridge University and then went back to East Africa, where he spent most of the rest of his life.

In 1931 he began to dig in the Olduvai Gorge, a place in the East African nation of Tanzania where sedimentary rock had been laid down for 2 million years. Leakey thought there might be traces of early hominids in it.

He did discover three skulls in the early 1960s that looked as though they might be of Home erectus except that they held even smaller brains, brains that were only half the size of those of Home sapiens. The bones were more delicate than those of Home erectus, too.

These new skulls might date back 1.8 million years, and Leakey named them *Home habilis* (HAB-ih-lis), or "skillful man." Leakey gave it that name because stone tools were found near the skulls, so that it appeared that, however small-brained, *Homo habilis* was skillful enough to make tools.

Homo habilis seems to be the oldest hominid who resembles human beings sufficiently closely to be put into the genus Home.

Leakey thinks that *Homo habilis* evolved in two directions. In one direction, the brain got somewhat larger, but the bones of the skull grew thicker, and heavy eyebrow ridges developed, along with changes in the teeth, and that produced Home erectus. In another direction, the brain grew much larger while the skull bones remained rather delicate, and that produced Home sapiens.

It seems simpler to suppose that the brain grew smoothly and that *Homo habilis* became *Homo erectus,* and that *Homo erectus* became *Homo sapiens.*

It will take the discovery of more hominid fossils before we can come to a clear decision as to the direction in which evolution proceeded.

4. The Little Ape-Men

SO FAR WE HAVE described three hominids, all members of genus *Homo*. There is *Homo sapiens* (ourselves, Cro-Magnon Man, and Neanderthal Man), *Homo erectus* (Peking Man and Java Man), and *Homo habilis*.

Are there any hominids that are so different from modern human beings that they don't belong to genus *Homo*?

The honor- of the discovery of such a hominid goes to an Australian physician, Raymond Arthur Dart (born 1893). In 1923 he went to Johannesburg, South Africa, to teach anatomy at a medical school there.

There, in 1924, he came across a fossil baboon skull on someone's mantelpiece and asked where it came from. It came from a place called Taung, where they were blasting down some limestone cliffs.

Dart sent a message that he wanted to see any fossils they found, and pretty soon he got a box full of limestone with fossils in them.

Among the fossils were pieces that, when fitted together, showed the teeth, jawbones, and face bones of something that looked like a young ape. It didn't look right, though. The hollow for the brain was too large for a young ape. There was no eyebrow ridge, and the face didn't look entirely apelike.

Dart called the creature *Australopithecus africanus* (aw-STRAY-loh-pih-THEE-kus-af-rih- KAN-us), or "southern ape from Africa." He published his description of the bones in 1925 and suggested that it was midway between apes and men.

At that time, people were still arguing over Java Man and Dubois wasn't letting anyone look at the bones he had found. Only a tooth of Peking Man had been found. The world wasn't quite ready for Dart's suggestion. Most of the experts who read Dart's description thought it was a young ape, much closer to the chimpanzee and gorilla than to the human being.

For ten years nothing more developed. No other hominid relies were found.

One person who accepted Dart's view, however, was a Scottish paleontologist, Robert Broom (1866- 1951). In 1934 he came to South Africa to look for more bones of the creature Dart had discovered.

Broom found that there were limestone caves not far from Johannesburg and that fossil bones of a baboon had been found in one. In 1936 Broom went to the caves and almost at once found another fossil skull of Australopithecus, an adult one this time.

For two years he kept track of the blasting of the limestone, and every once in a while something turned up. A piece of thighbone appeared. Then he located a schoolboy who had found a fossil at another location. He went to the new place and got a big piece of jaw and skull.

This new fossil seemed to be of a creature that was bigger than Dart's find. Broom called it *Paranthropus* (PAR-an-THROH-pus) to show that he regarded it as being closer to human beings than to apes, for the name meant "resembling man." By that time, Java Man had been accepted and Peking Man had been discovered, so the world of science was more ready to accept these still-earlier hominids.

World War II stopped things, but after the war, Broom got back to work, and before he died, he found many more fossils, some of the larger kind, *Paranthropus*, and some of the smaller kind, *Australopithecus.*

They are now considered members of the same genus, but not of genus Home.

Even though *Paranthropus* and *Australopithecus* are not of genus *Homo,* they are still hominids. Their teeth are much more human than apelike, and from their hipbones you can tell that they walked upright like human beings.

They were small in size. *Paranthropus* may have been almost as tall as Home erectus, but *Australopithecus* was only four feet tall at most and had a brain only half the size of that of modern human beings. In fact, the brain of *Australopithecus* was no larger than that of a modern gorilla.

Still, *Australopithecus* was smart enough to make simple stone tools, while gorillas are not. That may be because the brain of Australopithecus was in charge of a much smaller body than the gorilla brain is. This may mean that there was more room in *Australopithecus*'s brain for thinking, since less of it had to be taken up by the needs of its body. *Australopithecus* is a little more human in appearance than *Paranthropus* is. It may be that *Homo habilis* evolved from *Australopithecus*, while *Paranthropus* may have been an offshoot that died out and left no descendants.

Australopithecus first appeared on the scene as long as 4 million years ago. It may have remained alive until 500,000 years ago, even after *Homo habilis* and *Homo erectus* had evolved from some of its varieties.

Not everything went smoothly in the search for human ancestors. There were some false alarms.

In 1935, for instance, von Koenigswald (who was soon to go to Java in search of' more skeletons of Java Man) came across four interesting teeth in Hong Kong drugstores. They looked just like human teeth, but they were much larger.

So far, all the early hominids were smaller than Home sapiens, but perhaps giant hominids had also existed. After all, the Bible mentions giants, and the legends of almost all peoples deal with them. The giants are usually pictured as stupid, so it may be that they had large bodies but not very large brains.

Von Koenigswald called the creature from which the teeth came *Gigantopithecus* (jy-GAN-toh-pih-THEE-kus), or "giant ape."

For twenty years people wondered about *Gigantopithecus*, and then, in 1955, Chinese scientists decided to poke through all the drugstores to find any further parts of the creature that might exist. They discovered dozens of teeth and a couple of lower jaws.

It turned out that Gigantopithecus was exactly what the name meant. It was not a hominid at all but a giant ape about nine feet tall, the largest ape that ever lived. Despite the human-looking teeth, the jaw bones of` *Gigantopithecus* were ape like.

Gigantopithecus may not have become extinct until a few hundred thousand years ago, however, maybe not until after *Homo sapiens* had appeared. It may be, then, that *Gigantopithecus* did indeed give rise to the legends of stupid giants.

But *Gigantopithecus* was not a hominid. To this day, it appears that *Homo sapiens* is the tallest and largest hominid that ever lived.

Even more puzzling than Gigantopithecus was a find made in Piltdown, in southern England, in 1911 by an English lawyer, Charles Dawson (1864-1916). It consisted of a skull and lower jaw. The skull seemed quite human, and the jaw seemed quite apelike. It was named *Eoanthropus* (EE-oh-an-THROH-pus), or "dawn-man," and it was commonly called *Piltdown Man.*

For forty years it puzzled paleontologists, who didn't know where to put it among the ancestors of human beings. In all the other hominids, as the skull grew more human, the jaw grew more human, too. A hominid with a modern skull and an ancient jaw didn't seem right.

It wasn't. By 1953 it was clearly proved that the whole thing was a fake. The skull was human, and the jaw teas that of an ape. The skull had been treated to look very old, and the jaw had been filed down to make it fit.

The fake would never have succeeded in fooling anybody if it weren't that in 1911 paleontologists still didn't know much about the early hominids.

5. How It Began

SO FAR WE HAVEN'T mentioned any real missing link. Even the earliest hominid, *Australopithecus africanus*, was much closer to *Homo sapiens* than to any of the apes. As to *Gigantopithecus*, that was much closer to apes than to *Homo sapien's*, and *Piltdown Man* never existed at all.

Still, *Australopithecus* must have existed in Africa at the same time as the ancestors of the chimpanzee and gorilla existed there. Could there have been a still-earlier creature who was ancestor to all these forms and who was therefore the true link--the ancestor of the chimpanzee, the gorilla, and the hominids?

In 1934 an American paleontologist, G. Edward Lewis (LOG-is) was searching through ancient deposits in the Siwalik Hills, ill northern India. There he found some teeth and pieces of jaw. They were in rocks that were much too ancient for even *Australopithecus*. Whatever creature owned those teeth must have lived at least 7 million years ago and possibly even 14 million years ago.

Lewis called the creature *Ramapithecus* (RAM- uh-pih-THEE-kus), or "ape of Rama." Rama is one of the important Gods of the Hindus in India, so the name is a one for a fossil found in that country.

Lewis felt that the teeth were too small to be those of all ape, and that *Ramapithecus* had to use hands to hold its food. He felt it should be considered a hominid, hut most other paleontologists disagreed with him at the time.

In 1961, however, Leakey discovered teeth of a creature very much like *Ramapithecus* in the African nation of Kenya. Other teeth and jawbone pieces were also found, but no bones from the body itself.

Considering all the evidence that now exists, however, paleontologists have decided that Lewis was right in the first place. *Ramapithecus* was a very early hominid, even smaller than Australopithecus, and it was probably already walking erect. It is the earliest hominid so far discovered; maybe it is the first hominid.

What about the ancestors of the apes? I have already mentioned *Gigantopithecus*, but although that is an extinct ape, it is not the ancestor of the modern apes. We would have to go farther back.

Louis Leakey and his wife, Mary, digging along the shores of Lake Victoria, in East Africa, came across the bones of what was clearly an extinct ape.

There was no question about that, for its jaws and teeth were very apelike.

Leakey named it in honor of a chimpanzee in the London Zoo who was called Consul and who was a great favorite with the public. Leakey called the new find *Proconsul* (proh-KON-sul), meaning "before Consul." Quite a few bones of Proconsul were found, including an almost complete skeleton, so paleontologists could see in what ways it was more primitive than present-day apes.

Proconsul seems to be a member of a group of species of primitive apes, all of which belong to a genus called *Dryopithecus* (DRY-oh-pih-THEE- kus), or "oak-tree ape." It is called this because the fossils were found along with some traces of ancient oak forests.

Dryopithecus was probably still living in the trees and did not walk upright. The first *Dryopithecus* bones were discovered in France as long ago as 1856, but in recent times a number of fossils of the *Dryopithecus's* type have been discovered in east Africa.

There were apparently *Dryopithecus* species of different sizes, some quite small, and some as large as a gorilla. The earliest species seem to have developed about 25 million years ago.

Dryopithecus seems to be the ancestor of present-day chimpanzees and gorillas, but the question is whether it also gave rise to *Ramapithecus* and whether it is the link, found at last, between the apes and human beings.

Paleontologists aren't sure of this, however. We need more bones of *Rnmapithecus*, especially body bones, before we will be able to tell.

There are fossil finds in Egypt dating back to 40 million years ago, fossils that show that apelike creatures existed even then. One of them is *Aegyptopithecus* (ee-JIP-toh-pih-THEE-kus), or "Egyptian ape." If *Dryopithecus* was not the common ancestor of the hominids and the African apes, then *Aegyptopithecus* or another creature of that period was.

Here, then, is how we can summarize human beginnings.

About 70 million years ago, when the last dinosaurs died off, monkey like creatures had evolved horn more primitive creatures, somewhat resembling the lemurs of today.

By 40 million years ago in Africa, some of these monkeylike creatures had lost their tails, developed larger brains and better hands, and had become apelike creatures. *Aegyptopithecus* was

an example.

As time went on, some of these early apelike creatures must have made their way out into southern and Southeast Asia and eventually evolved into gibbons and orangutans.

Dryopithecus continued to develop in the direction of large teeth and jaw bones, strong bones, but only a moderately larger brain, and eventually evolved into both the chimpanzee and the gorilla.

About 20 million years ago, however, some *Dryopithecus* species seem to have developed in another direction. They developed smaller teeth and jaws and thinner bones. Because the teeth and jaws were smaller, these *Dryopithecus* species had to use their hands more for seizing food and bringing it to their mouths.

When a drying climate killed off the forest, they came down from the trees. Their hipbones developed in such a way that they could stand upright in the grasslands, and their hands were then free to be used all the time.

Perhaps because their hands were always free to feel things, lift things, carry things, poke things, and pull things apart, their brain was stimulated and slowly developed into a larger size.

These hand-using creatures, standing upright, were the first hominids, and they appeared about 20 million years ago.

The first hominid we have a record of is *Ramapithecus*, who appeared in East Africa, but who spread out into Asia perhaps 10 million years ago.

In Africa, *Ramapithecus* grew larger and brainier, and by about 4 million years ago, Australopithecus had developed.

Development continued in the direction of increased size of body and brain, and about 2 million years ago, the first hominids appeared who were sufficiently close in structure to the human being to be placed into genus Home. Thus we have *Homo habilis.* By that time the hominid brain had developed to the point where it was larger than that of any ape that ever lived past or present. It was still considerably smaller than the brain of present-day man, however.

About 1.5 million years ago, *Homo erectus* had developed. He seems to have wandered into Asia as far as China and Indonesia, thus producing the relics of Peking Man and Java Man.

For about a million years, Home erectus continued to evolve in the direction of a larger brain, and it discovered the use of fire. By about 150,000 years ago, the brain was large enough for us to consider the developing creature to be an example of *Homo sapiens.*

The oldest known example of Home sapiens was Neanderthal Man, but by about 50,000 years ago, we had Cro-Magnon Man, and after that progress became more rapid then ever.

About 10,000 years ago, *Homo sapiens* learned to grow crops, herd animals, build cities – and civilization began. About 5,000 years ago, writing was invented, and history began. About 400 years ago, modern science began, and about 200 years ago, an industrial society began.

Now here we are, still trying to work out the details of our human roots.

End